

RESPONSE TO EPA INFORMATION REQUEST

**FIRSTLIGHT POWER RESOURCES SERVICES, LLC
MT. TOM STATION
NPDES PERMIT NO. MA0005339**

Prepared for:

FirstLight Power Resources Services, LLC

Prepared by:

Kleinschmidt
Energy & Water Resource Consultants

MAY 2011

**RESPONSE TO EPA
INFORMATION REQUEST**

**FIRSTLIGHT POWER RESOURCES SERVICES, LLC
MT. TOM STATION
NPDES PERMIT NO. MA0005339**

Prepared for:

FirstLight Power Resources Services, LLC

Prepared by:

Kleinschmidt
Energy & Water Resource Consultants

MAY 2011

2.0 THERMAL DISCHARGE INFORMATION

2.1 ADDITIONAL THERMAL STUDIES

As discussed in the March 2, 2011 conference call with EPA, MTS is not in possession of any additional thermal studies conducted in the general area of Connecticut River at MTS, nor are we aware of any additional studies that may have occurred since 1974.

2.2 THERMAL PLUME ANALYSIS OF OUTFALL 001

MTS proposed modifications to the EPA's original request outlined in Section I(b) of the February 15, 2011 letter to allow for alignment with the plant heat transfer design capabilities of the station. Upon review of EPA's original request, as well as data obtained during a recent test of the plant's capabilities, it became clear that the scenarios requested to be analyzed were not feasible situations for MTS operations. Currently, when MTS operates at full load, the amount of heat discharged from the condenser to the cooling water system is approximately 6.3×10^8 BTU/hr. When operating at 100 percent power and using one circulating water pump (70 MGD), the delta T is approximately 26°F. When operating at full load with two circulating water pumps (133.2 MGD), the delta T is approximately 13°F. With this, MTS requested modifications to the four thermal discharge scenarios requested to be analyzed in EPA's February 15, 2011 letter. As proposed in the March 8, 2011 from MTS to EPA, the four scenarios analyzed were:

- 1) MTS discharge with a delta T of 26°F and a discharge temperature of 109°F during one pump operation using one circulating water pump and one river water pump (70 million gallons per day (MGD)). These operational conditions shall take place during warm weather summer period (air temperature 95°F) accompanied by low flow conditions in the Connecticut River (approximately 3,000 cfs).
- 2) MTS discharge with a delta T of 26°F and a discharge temperature of 103°F during one pump operation using one circulating water pump and one river water pump (70 MGD). These operational conditions shall take place during representative spring (April-May) conditions (air temperature 65°F) accompanied by spring flow conditions in the Connecticut River (approximately 15,000 cfs).

- 3) MTS discharge with a delta T of 13°F and a discharge temperature of 96°F during two pump operations using two circulating water pumps and two river water pumps (140 MGD). These operational conditions shall take place during warm weather summer period (air temperature 95°F) accompanied by low flow conditions in the Connecticut River (approximately 3,000 cfs).
- 4) MTS discharge with a delta T of 13°F and a discharge temperature of 90°F during two pump operations using two circulating water pumps and two river water pumps (140 MGD). These operational conditions shall take place during representative spring (April-May) conditions (air temperature 65°F) accompanied by spring flow conditions in the Connecticut River (approximately 15,000 cfs).

The extent of the MTS thermal plume was developed from expert information and modeled using CORMIX. CORMIX, also known as the Cornell Mixing Zone Expert System, is a software system specially designed for the analysis of mixing problems and was used to predict the extent of the thermal plume under various operational and river flow scenarios. Supplemental information included bathymetric and thermal profiles from the 1974 Thermal Plume Study and information collected by the EPA in August 2010. Other data, such as the intake and discharge flow rates, discharge temperature, and discharge geometry were assembled from currently available station data.

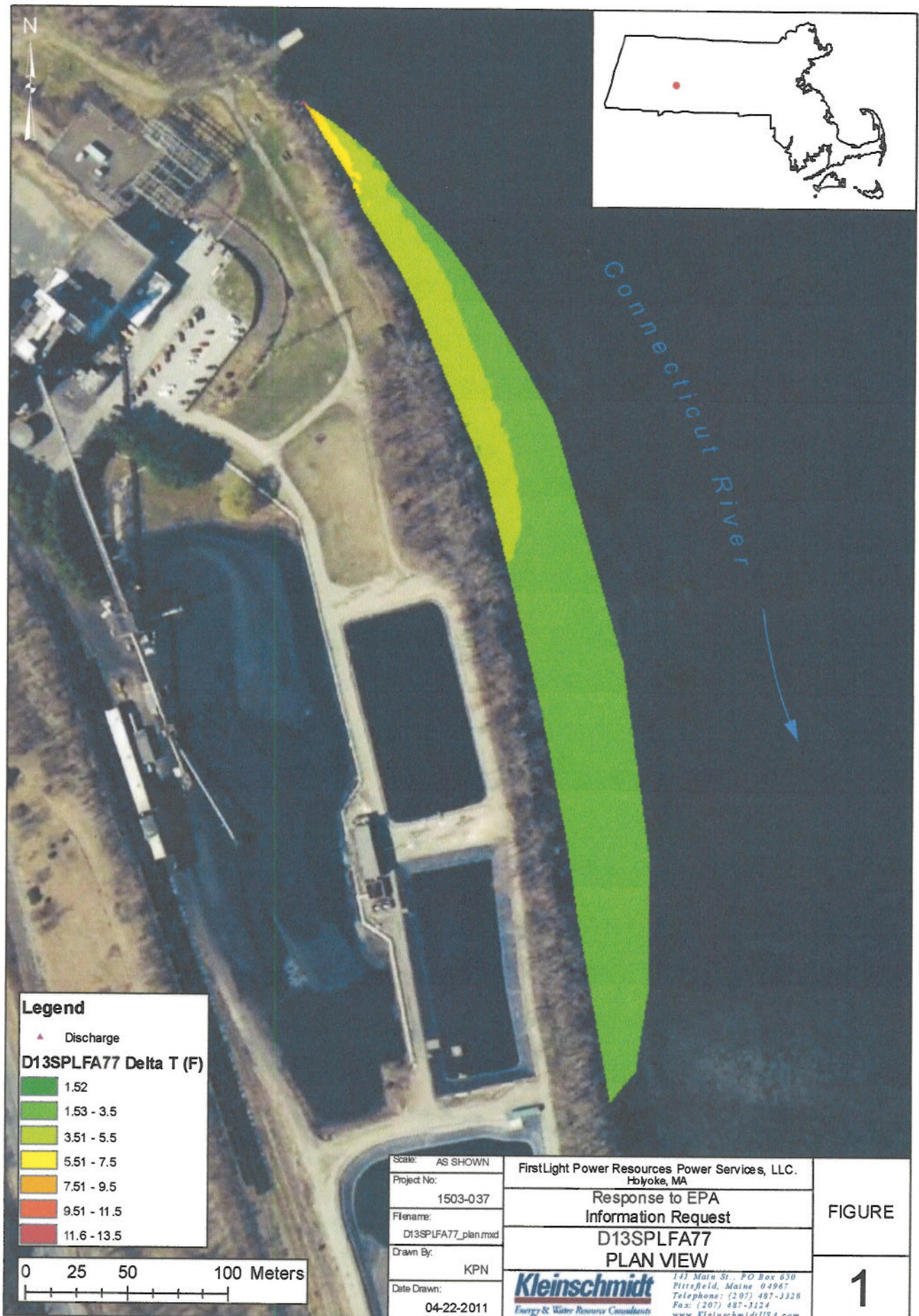
Models were developed under a series of seasonal conditions, which included flow rates and associated ambient temperatures. Previous thermal plume efforts have determined the domain of the modeling effort. The CORMIX model requires a distance downstream of at least ten times the river width, thus approximately 2,000 meters downstream; however, the effects of the plume as observed in the field are marginalized at this distance. The model was calibrated with data collected from previous studies, including ambient temperatures, discharge temperatures and flow rates. These studies include a 1974 Thermal Plume Study conducted by the Holyoke Water Power Company during a low flow and mid flow condition, in addition to data collected by the EPA in August 2010.

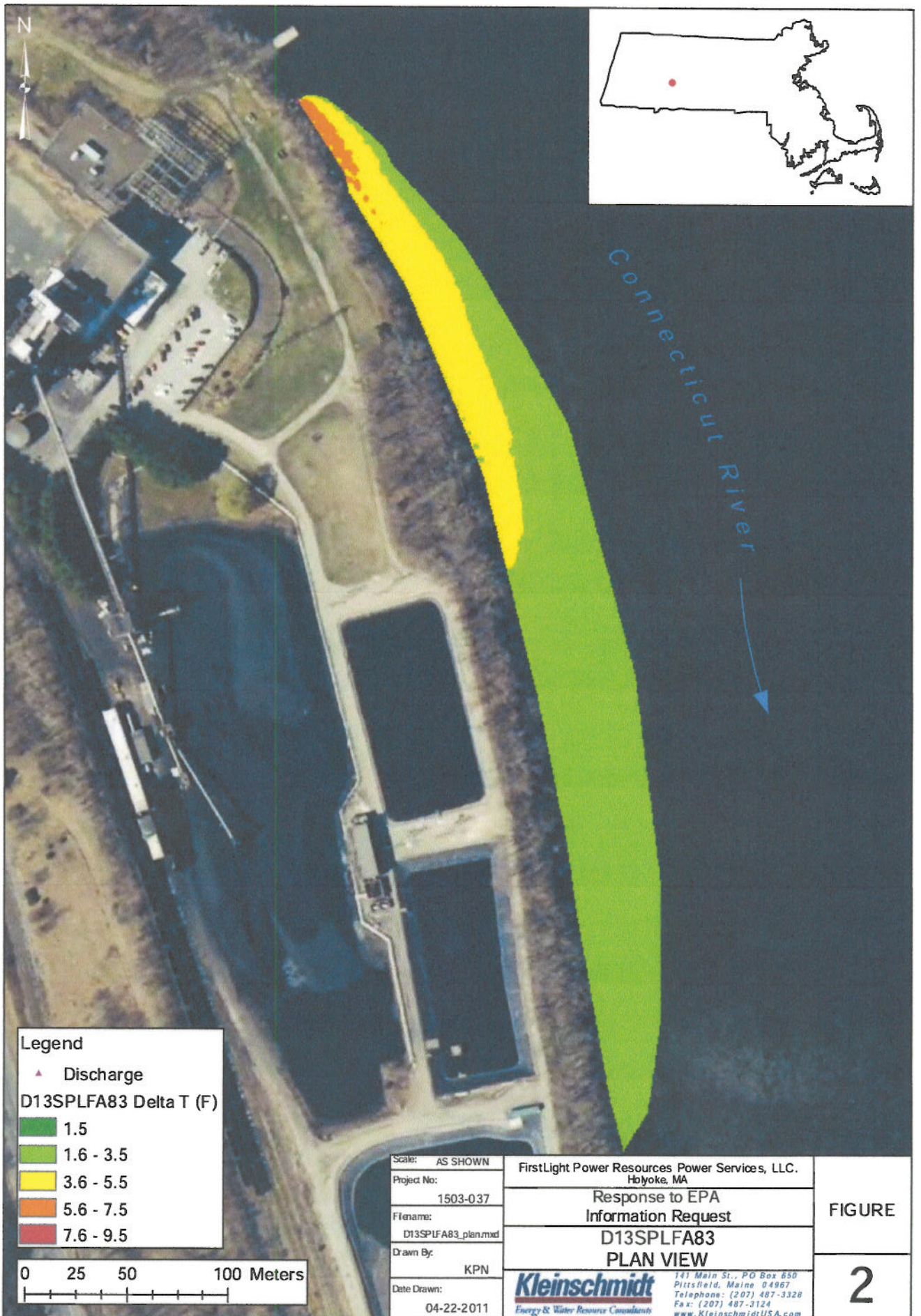
Model Scenario	Delta T (°F)	Station Flow (MGD)	River Flow (cfs)	Ambient Water Temp. (°F)	Discharge Water Temp. (°F)	Plan View Figure #	Longitudinal Profile Figure #
1	13	70	3,000	77	90	1	17A
2	13	70	3,000	83	96	2	17B
3	13	70	15,000	77	90	3	17C
4	13	70	15,000	83	96	4	17D
5	13	140	3,000	77	90	5	18A
6	13	140	3,000	83	96	6	18B
7	13	140	15,000	77	90	7	18C
8	13	140	15,000	83	96	8	18D
9	26	70	3,000	77	103	9	19A
10	26	70	3,000	83	109	10	19B
11	26	70	15,000	77	103	11	19C
12	26	70	15,000	83	109	12	19D
13	26	140	3,000	77	103	13	20A
14	26	140	3,000	83	109	14	20B
15	26	140	15,000	77	103	15	20C
16	26	140	15,000	83	109	16	20D

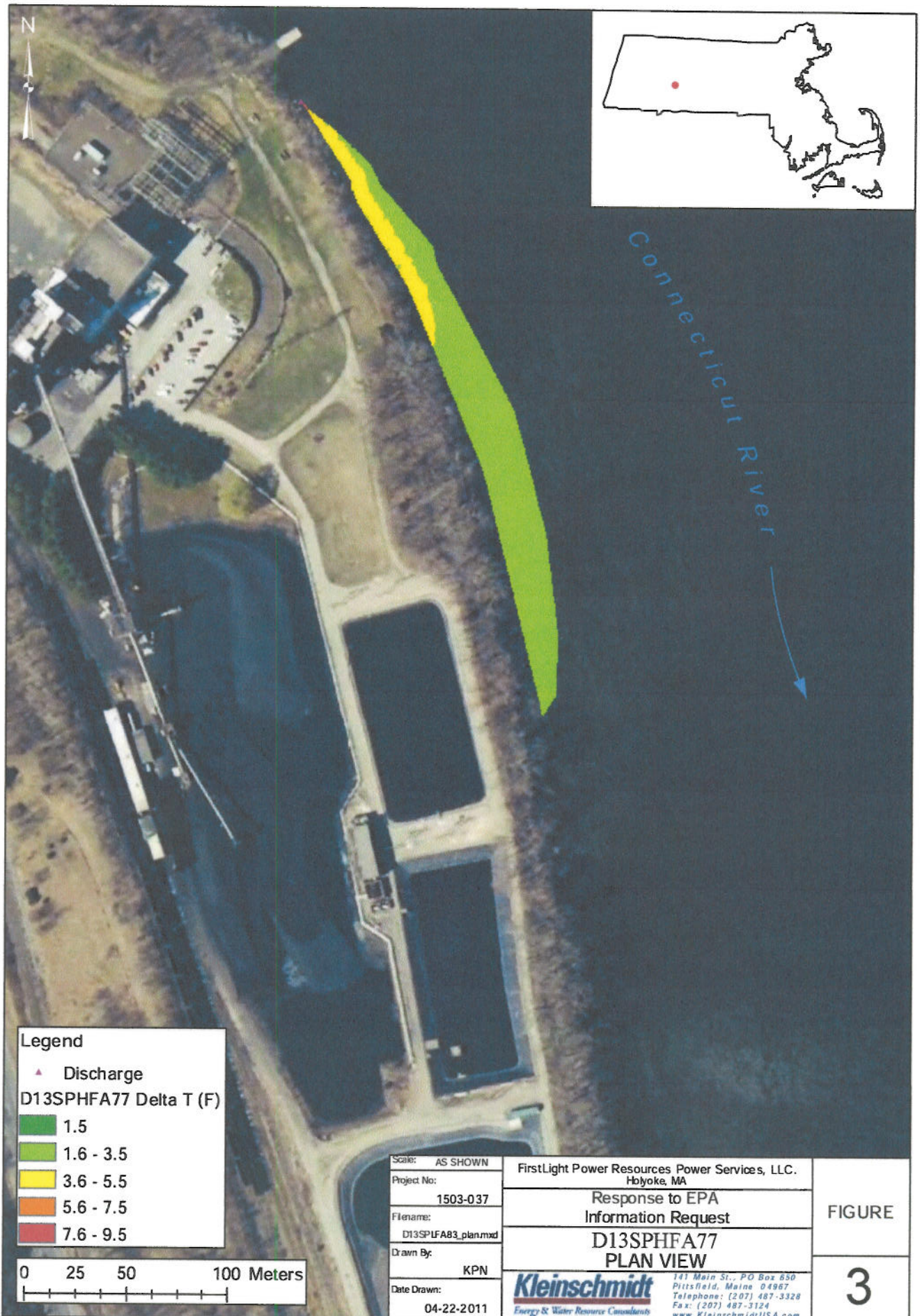
Model results included detailed mapping of the thermal plume in plan and longitudinal view under the various ambient river scenarios with an isotherm of delta 1.5°F (see Appendix B, Figures 1 - 20). However, post processing was required for mapping. The CORMIX model generated coordinates and geometry in an arbitrary datum with the discharge at the origin, and the output does not take into account localized rotation in the direction of cumulative flow or as the plume becomes bank-attached. Post processing, rotation, and projection were conducted using computer software. The discharge was projected onto Massachusetts State Plane NAD 1983 at N: 829983.9563, E: 108965.3866. The plume was then rotated in the polar direction of cumulative flow (5.2942 radians) until it was bank-attached. As the plume becomes bank-attached, the point of reference changes allowing for localized origins and rotation parameters. The local bank origins and rotation parameters in radians were calculated using the ESRI ArcMap 9.3.1 Coordinate Geometry tool. After post-processing, the plumes were imported into ArcMap, projected into Massachusetts State Plane coordinates and mapped.

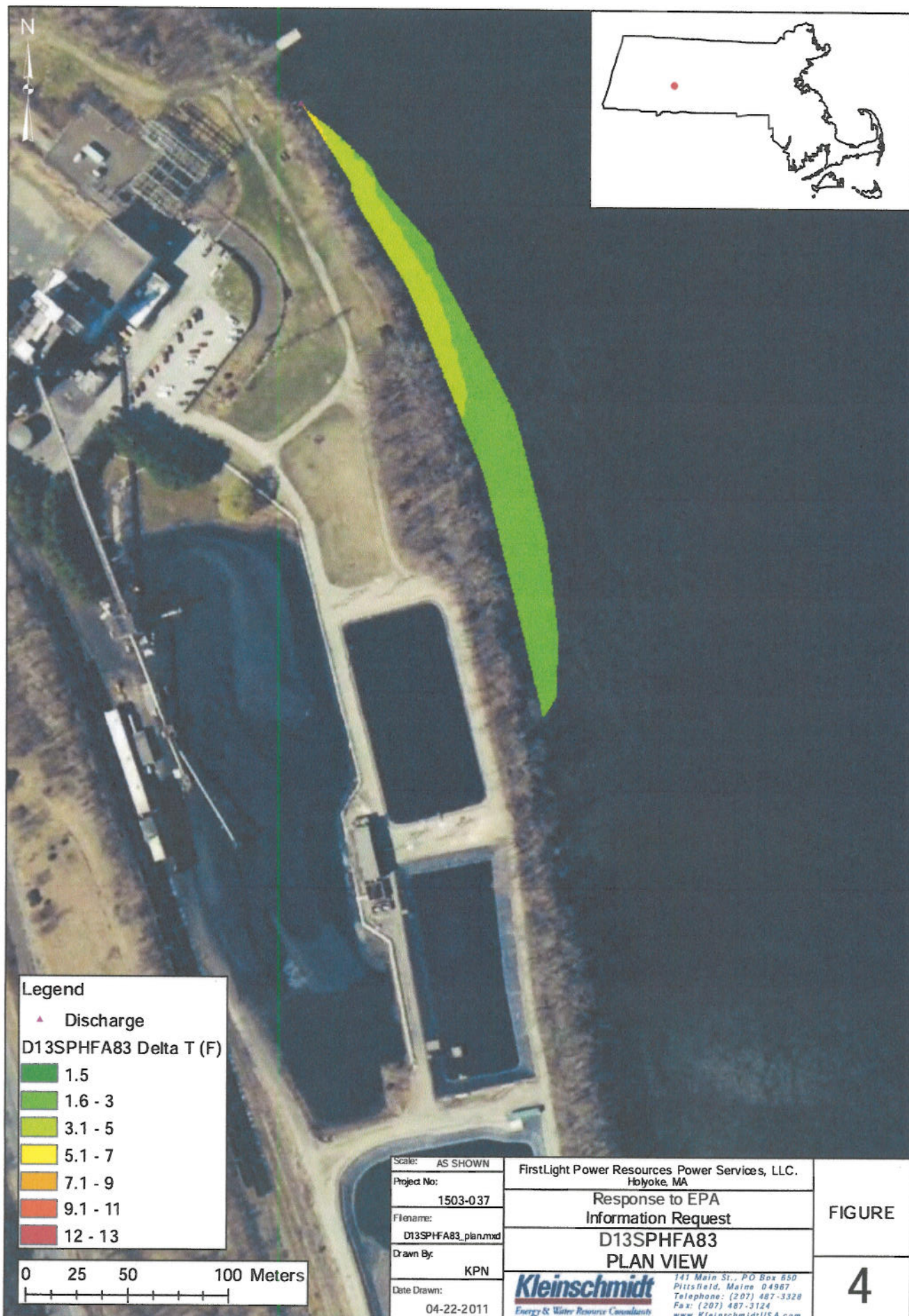
APPENDIX B

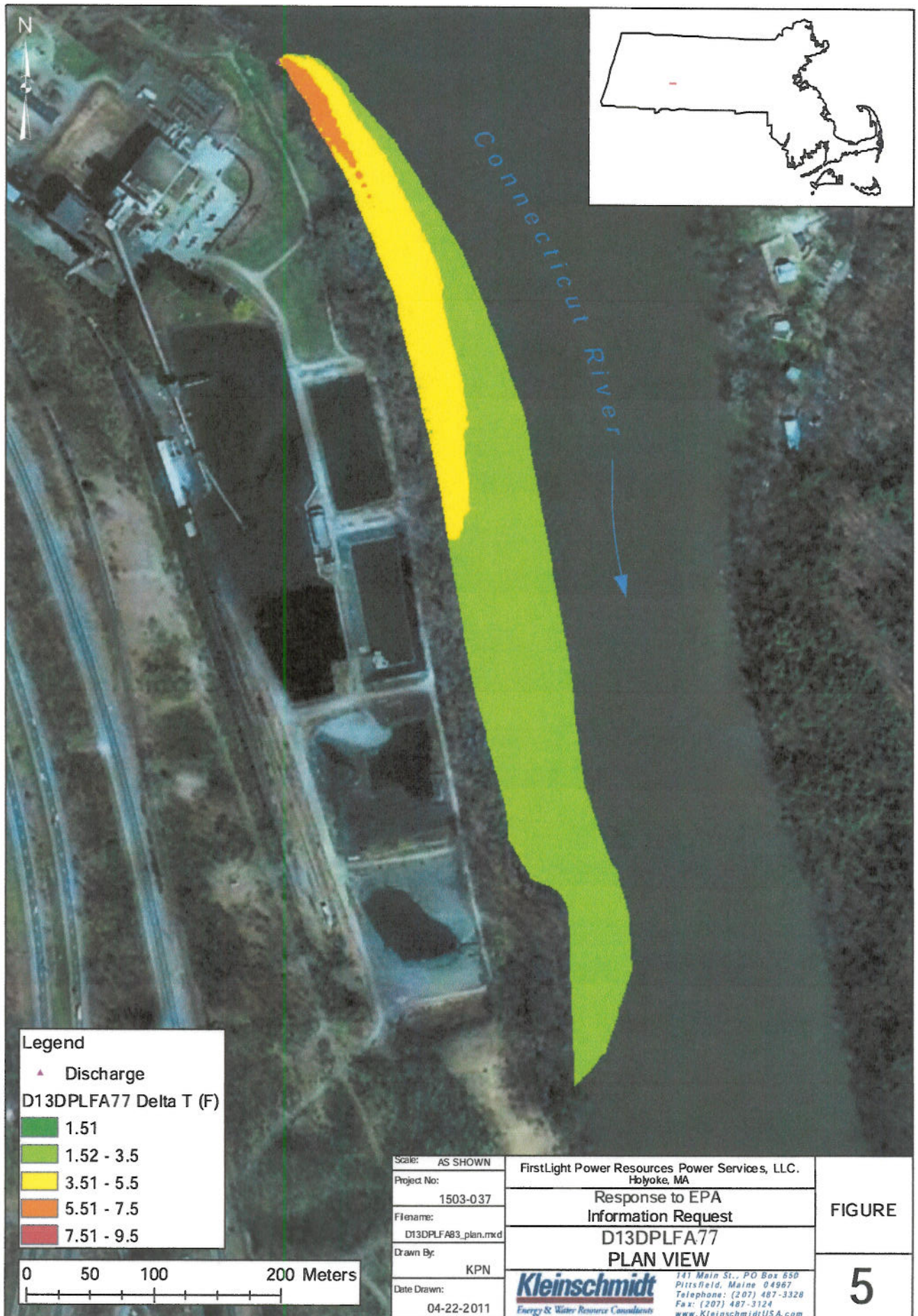
FIGURES



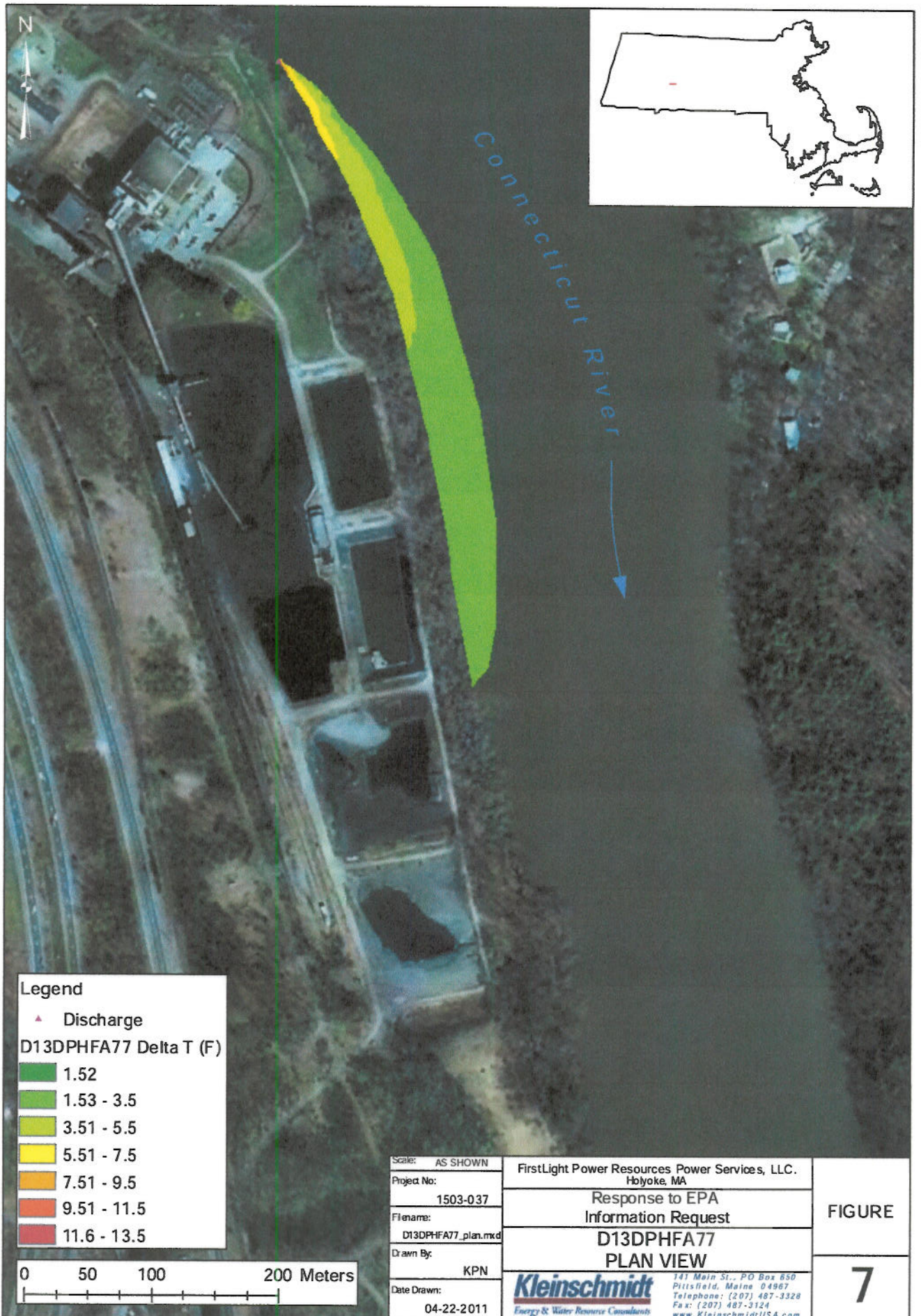


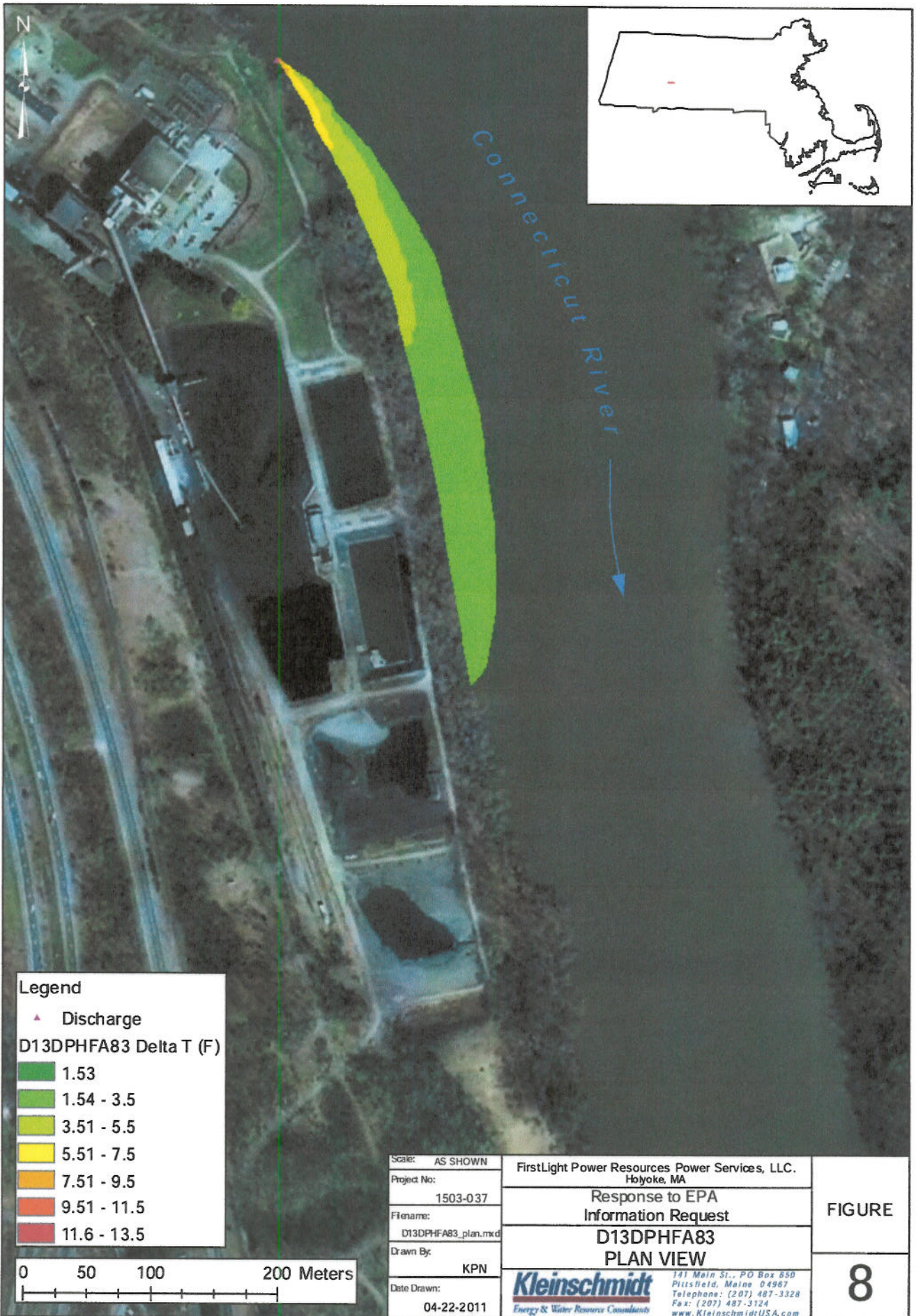


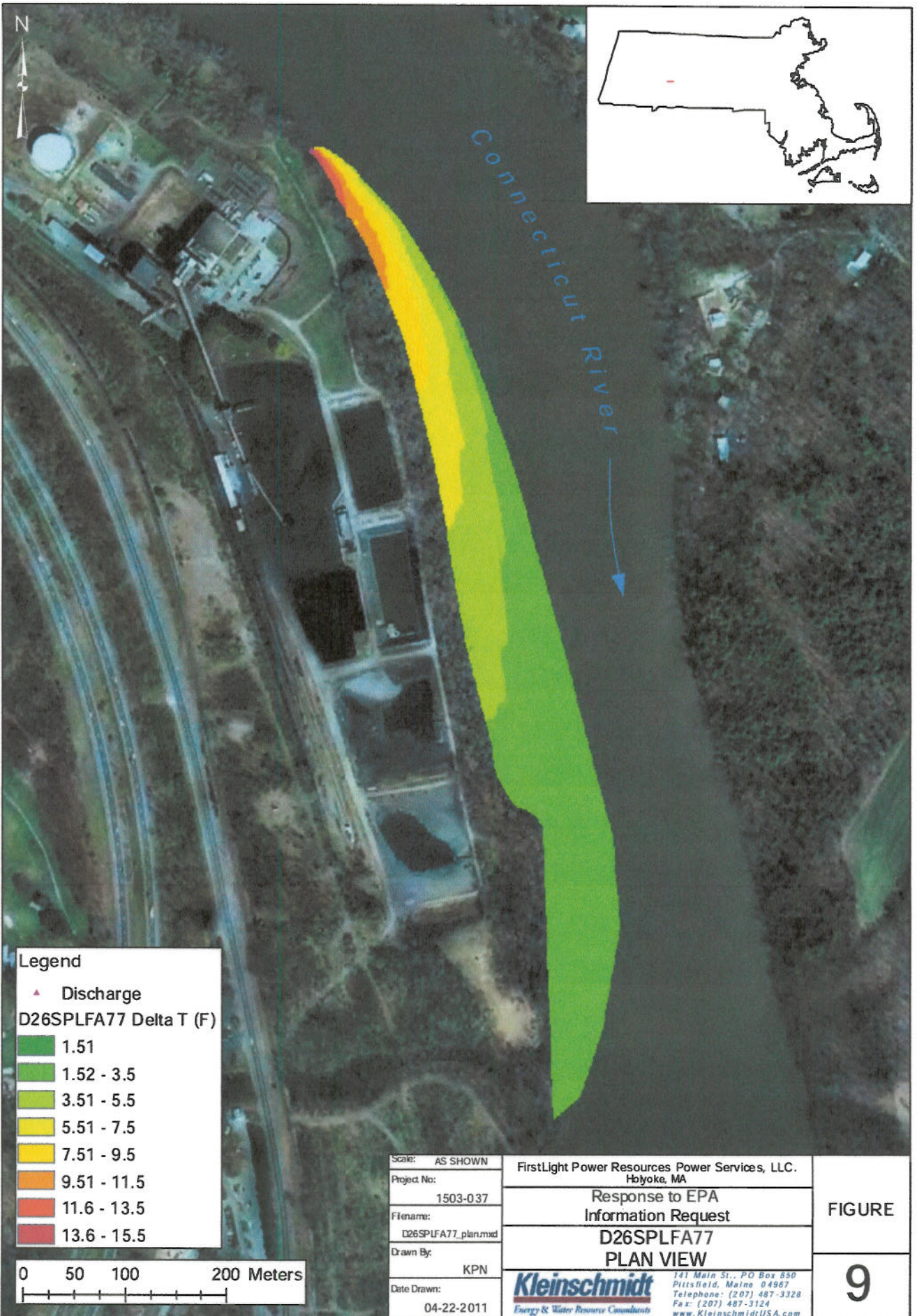


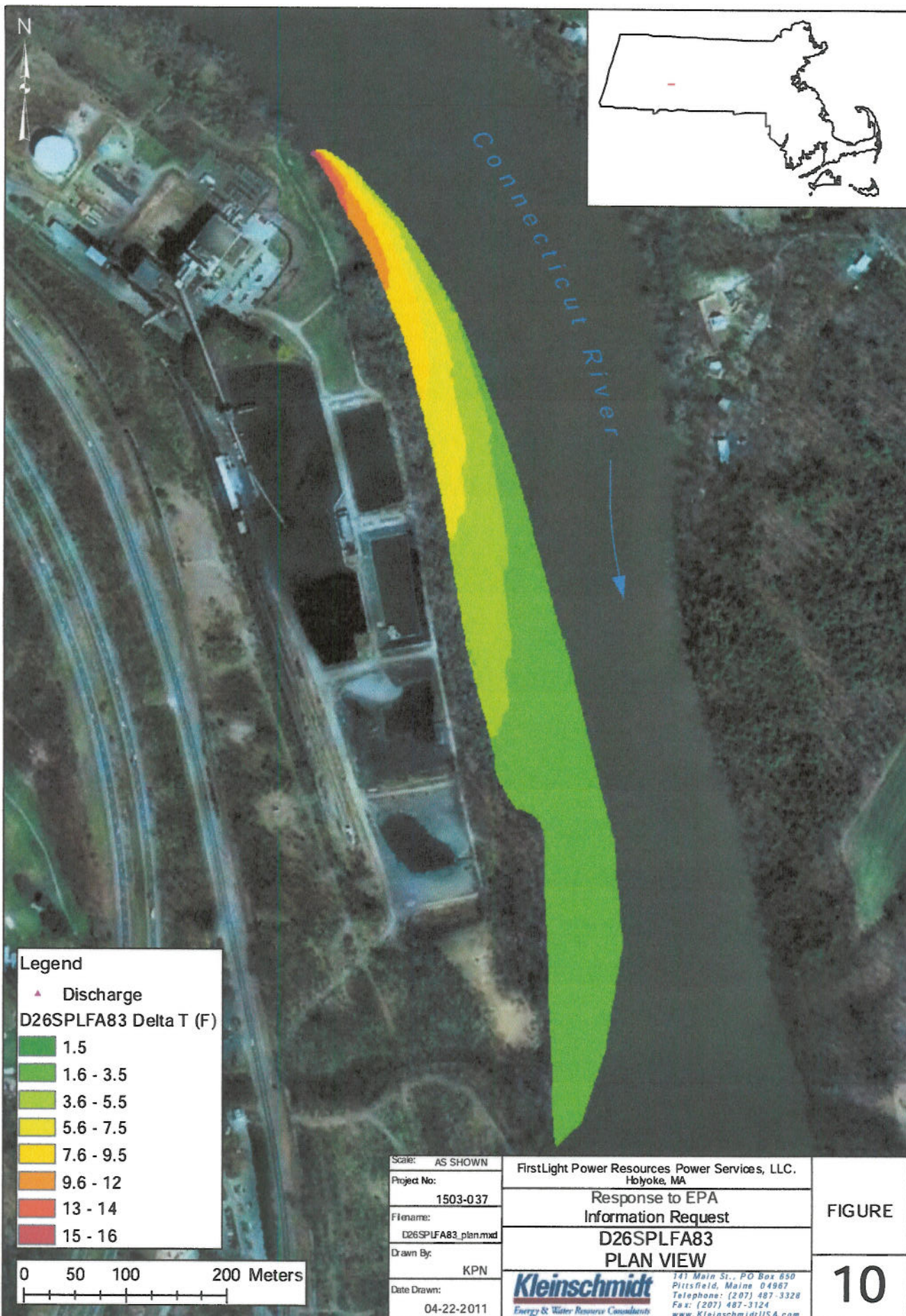


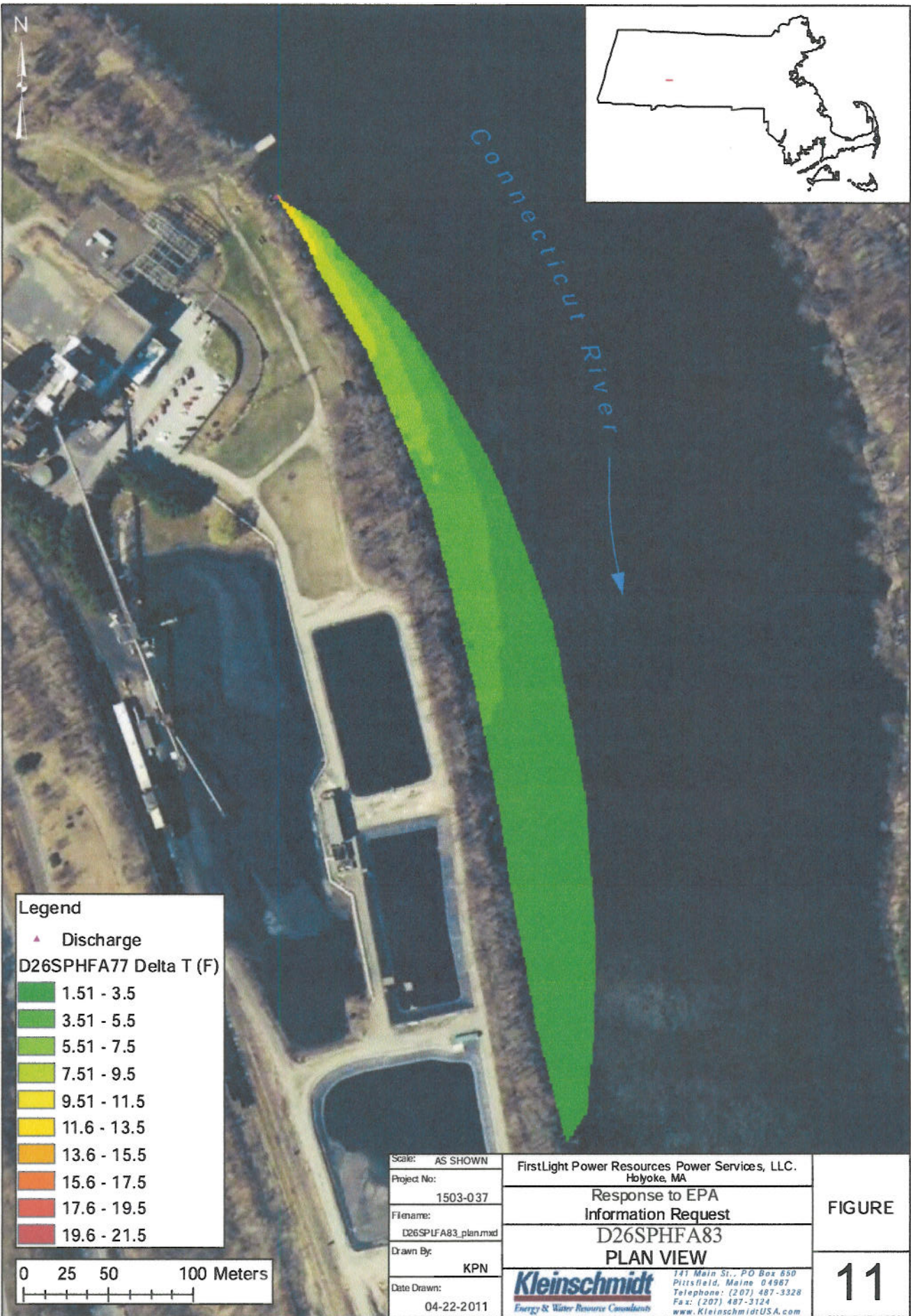






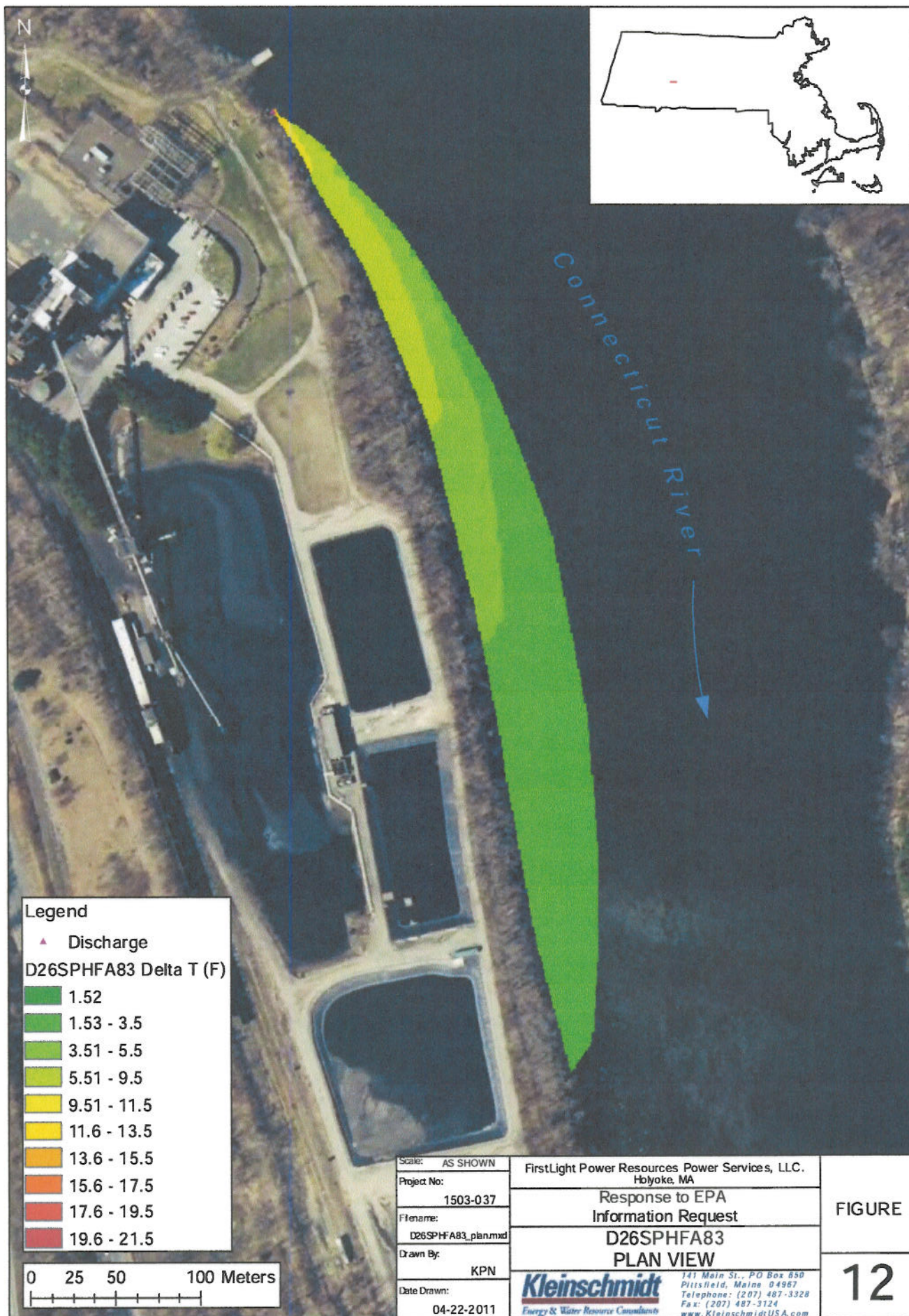


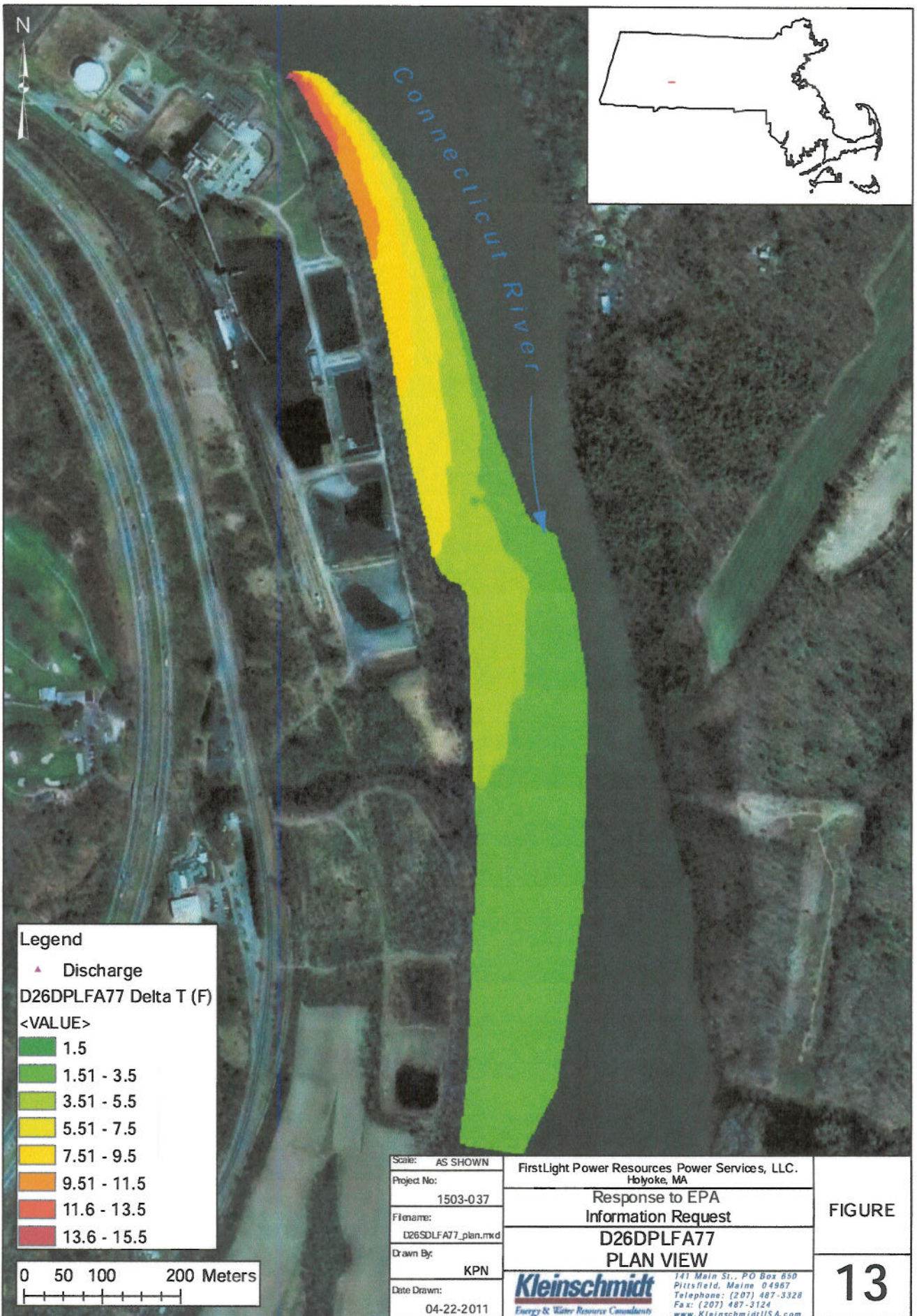


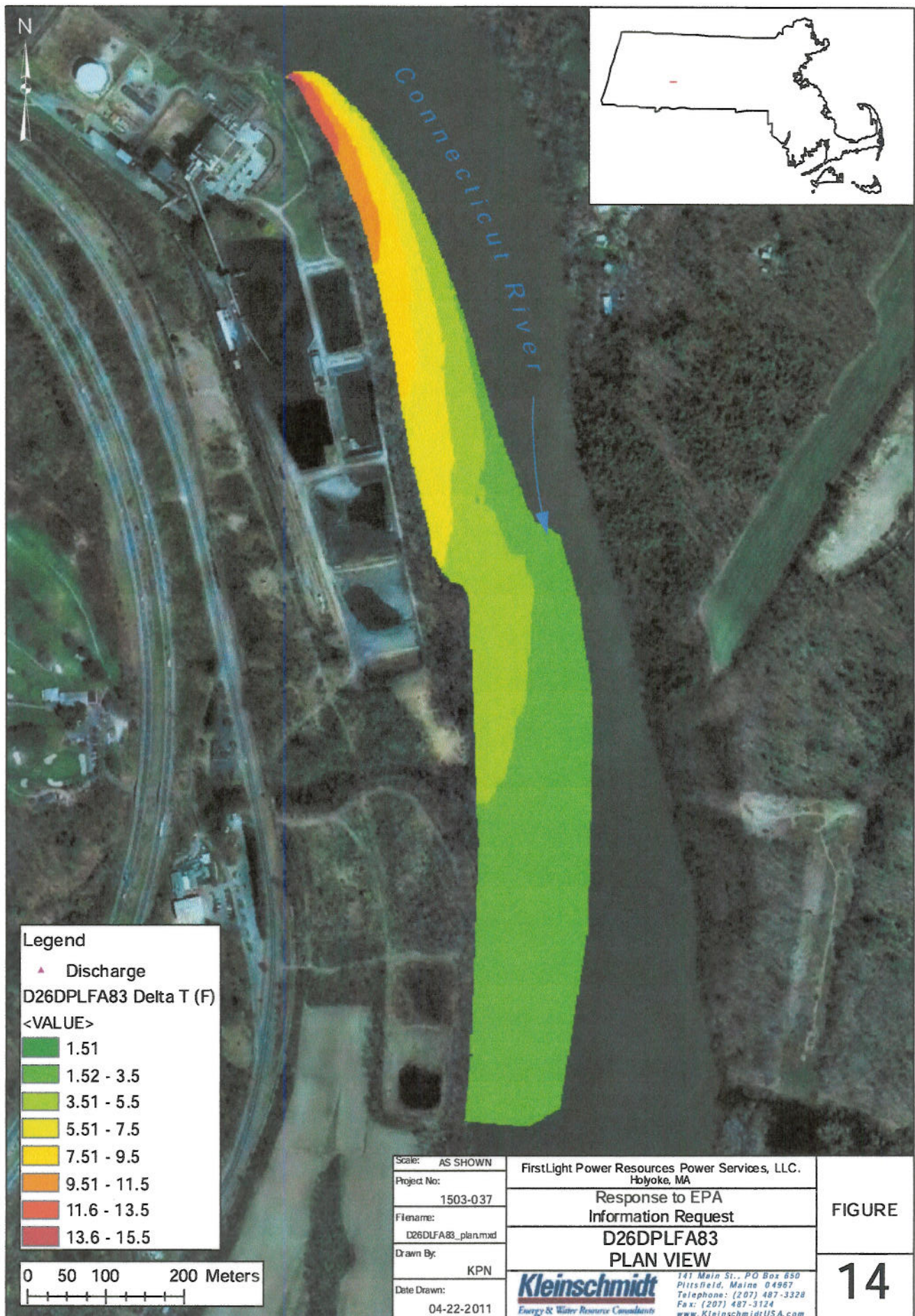


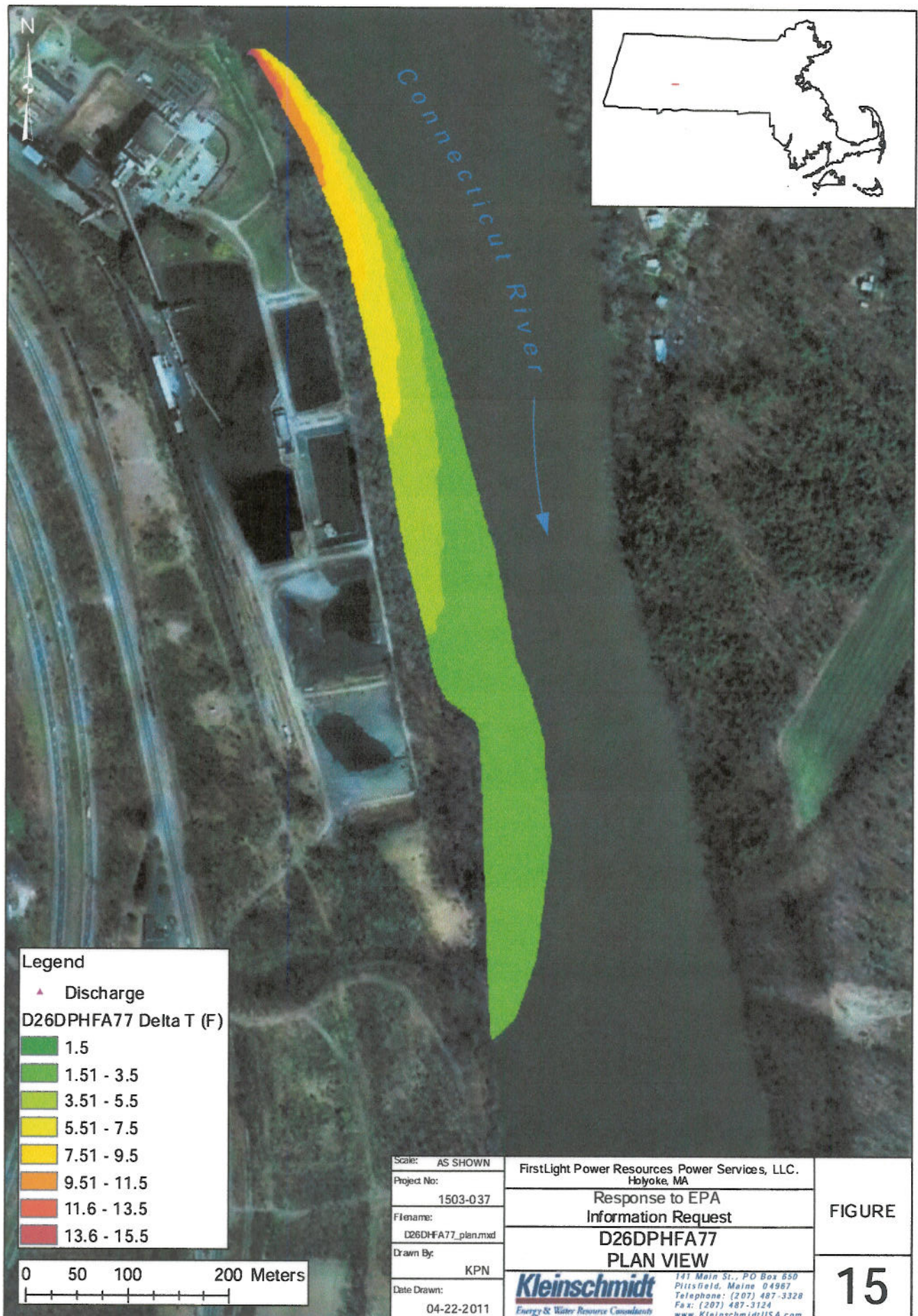
FIGURE

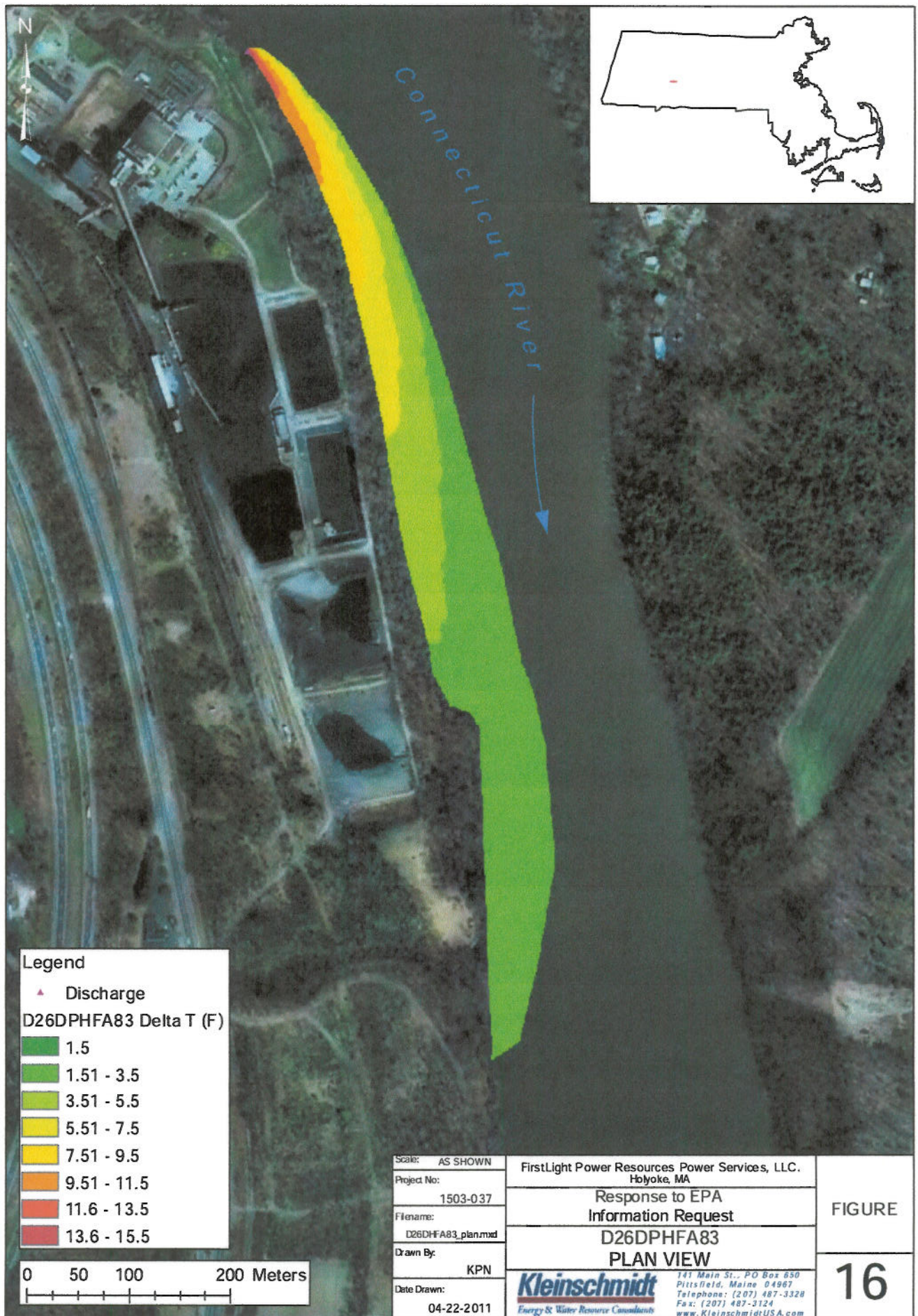
11





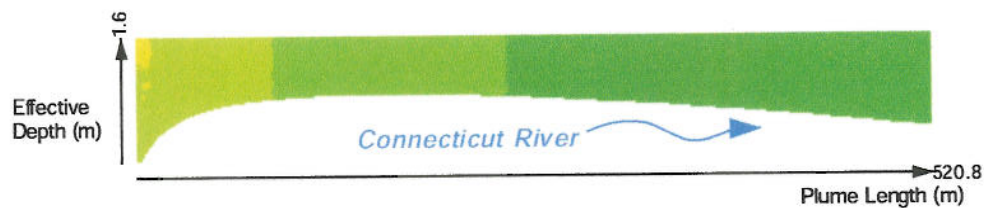






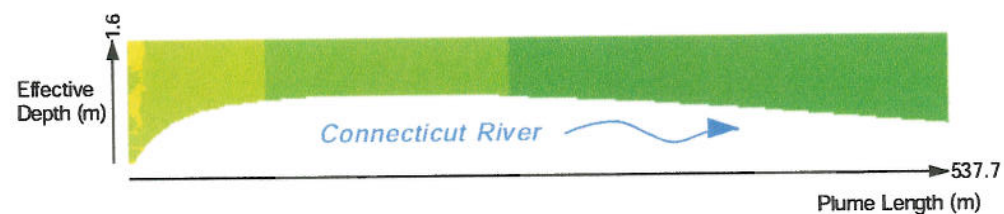
17A

D13SPLFA77



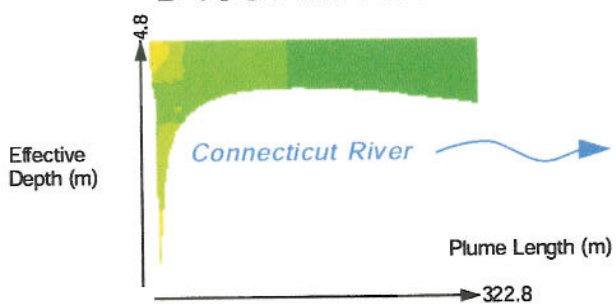
17B

D13SPLFA83



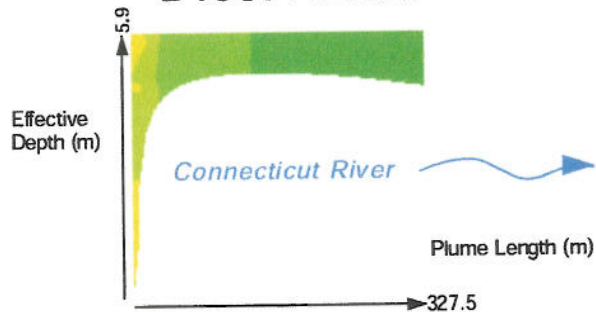
17C

D13SPHFA77

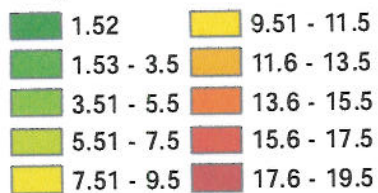


17D

D13SPHFA83



Longitudinal Plume Delta T (F)



Scale: AS SHOWN

Project No:

1503-037

Filename:

LongProfile1.mxd

Drawn By:

KPN

Date Drawn:

04-23-2011

First Light & Power
Holyoke, MA

Mt Tom Response to EPA

Longitudinal Plume (1)

Kleinschmidt
 Energy & Water Resource Consultants

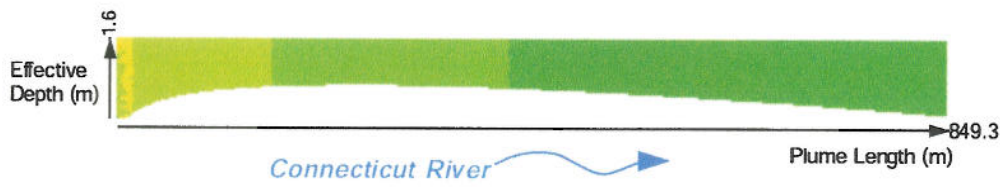
 141 Main St., PO Box 650
 Pittsfield, Maine 04967
 Telephone: (207) 487-3328
 Fax: (207) 487-3124
 www.KleinschmidtUSA.com

FIGURE

17

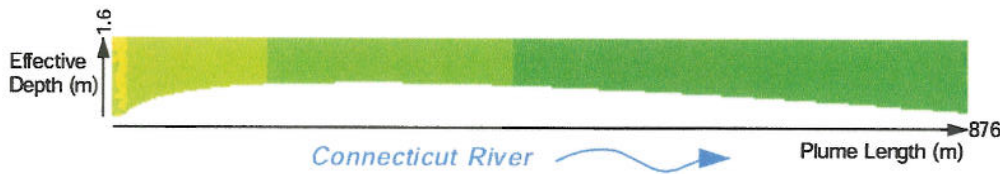
18A

D13DPLFA77



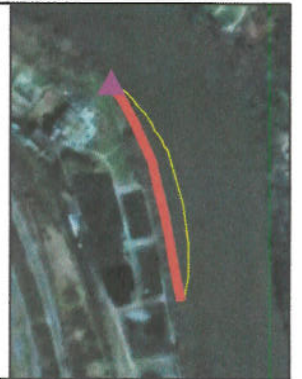
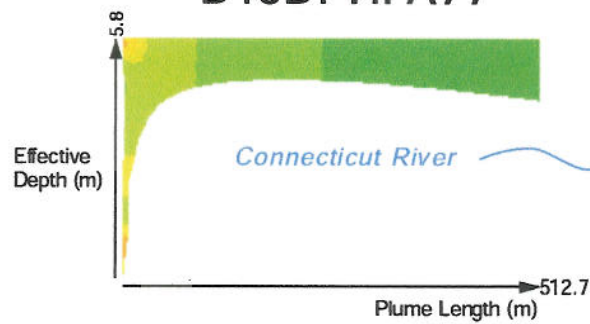
18B

D13DPLFA83



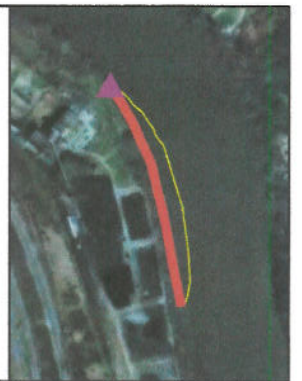
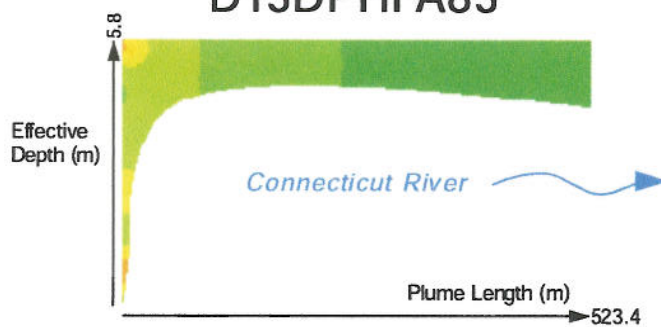
18C

D13DPHFA77

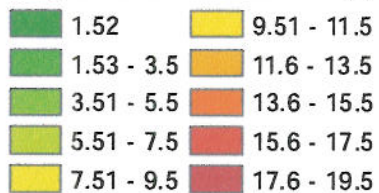


18D

D13DPHFA83



Longitudinal Plume Delta T (F)



Scale: AS SHOWN

Project No:

1503-037

Filename:

LongProfile2.mxd

Drawn By:

KPN

Date Drawn:

04-23-2011

First Light & Power
Holyoke, MA

Mt Tom Response to EPA

Longitudinal Plume (2)

Kleinschmidt
 Energy & Water Resource Consultants

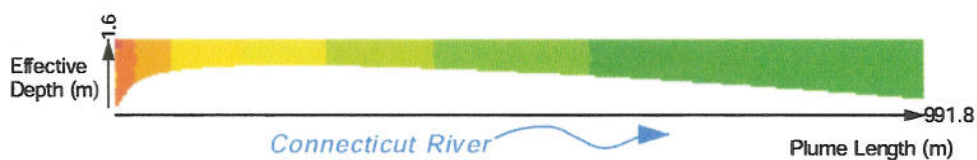
 141 Main St., PO Box 650
 Pittsfield, Maine 04967
 Telephone: (207) 487-3328
 Fax: (207) 487-3124
 www.KleinschmidtUSA.com

FIGURE

18

19A

D26SPLFA77



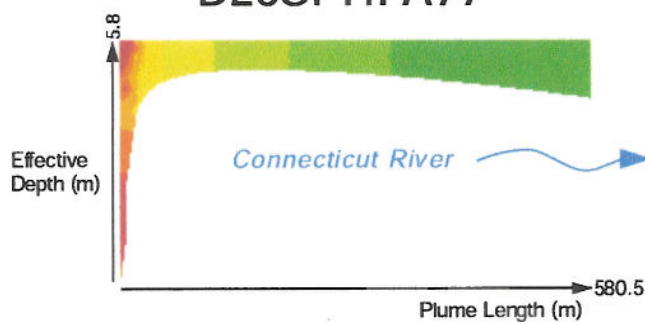
19B

D26SPLFA83



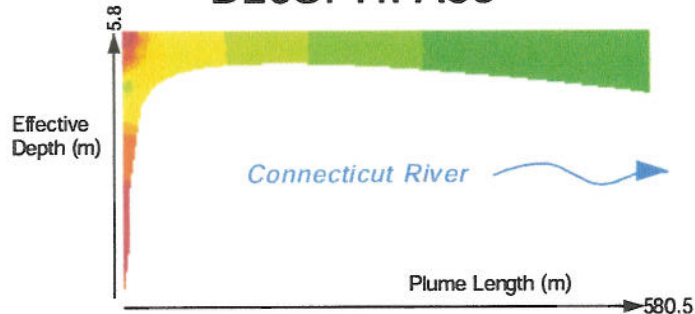
19C

D26SPHFA77

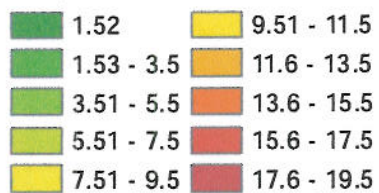


19D

D26SPHFA83



Longitudinal Plume Delta T (F)



Scale: AS SHOWN

Project No:

1503-037

Filename:

LongProfile2.mxd

Drawn By:

KPN

Date Drawn:

04-23-2011

First Light & Power
Holyoke, MA

Mt Tom Response to EPA

Longitudinal Plume (2)

Kleinschmidt
 Energy & Water Resource Consultants

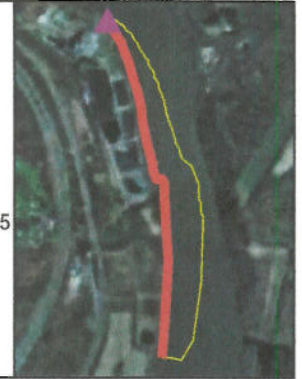
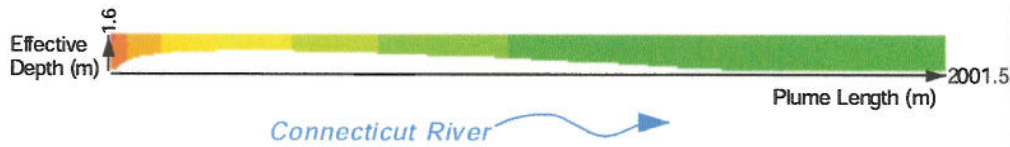
 141 Main St., PO Box 850
 Pittsfield, Maine 04967
 Telephone: (207) 487-3328
 Fax: (207) 487-3124
 www.KleinschmidtUSA.com

FIGURE

19

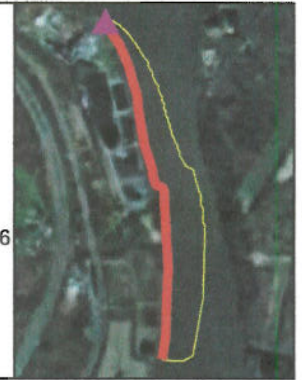
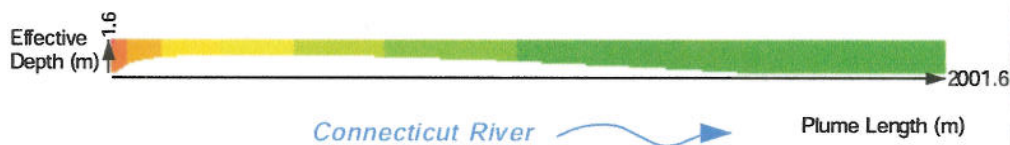
20A

D26DPLFA77



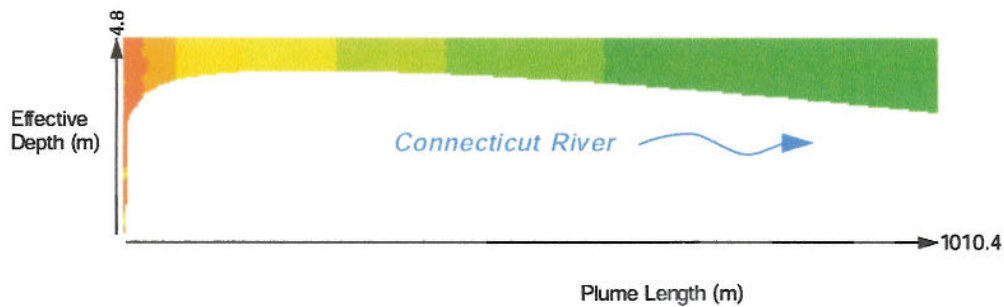
20B

D26DPLFA83



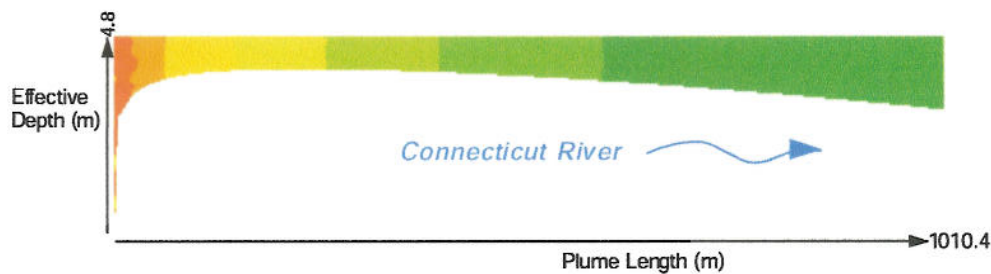
20C

D26DPHFA77

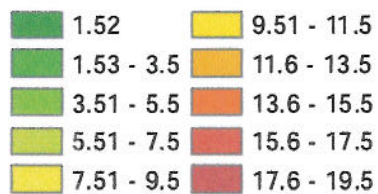


20D

D26DPHFA83



Longitudinal Plume Delta T (F)



Scale: AS SHOWN

Project No:

1503-037

Filename:

LongProfile4.mxd

Drawn By:

KPN

Date Drawn:

04-23-2011

First Light & Power
Holyoke, MA

Mt Tom Response to EPA

Longitudinal Plume (4)

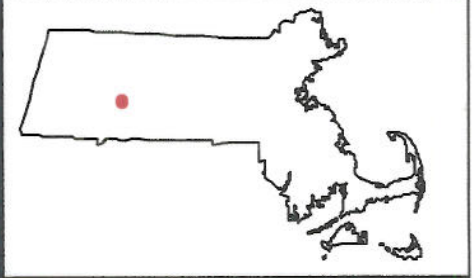
Kleinschmidt
 Energy & Water Resource Consultants

 141 Main St., P.O. Box 650
 Pittsfield, Maine 04967
 Telephone: (207) 487-3328
 Fax: (207) 487-3124
 www.KleinschmidtUSA.com

FIGURE

20



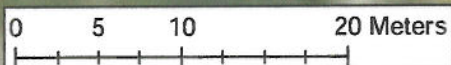
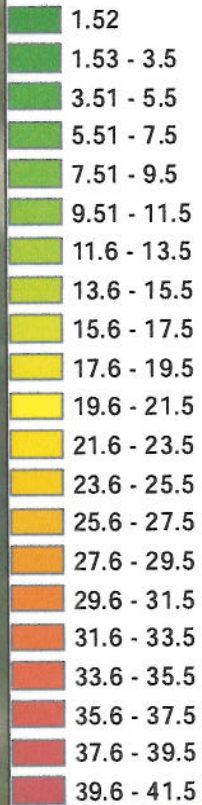


Connecticut River

Legend

▲ Discharge

D48CTL20KA50 Delta T (F)



Scale: AS SHOWN

Project No:

1503-037

Filename:

D26SP1FA83_plan.mxd

Drawn By:

KPN

Date Drawn:

04-22-2011

FirstLight Power Resources Power Services, LLC.
Holyoke, MA

Response to EPA
Information Request

D48C20KA82
PLAN VIEW

Kleinschmidt
Energy & Water Resource Consultants

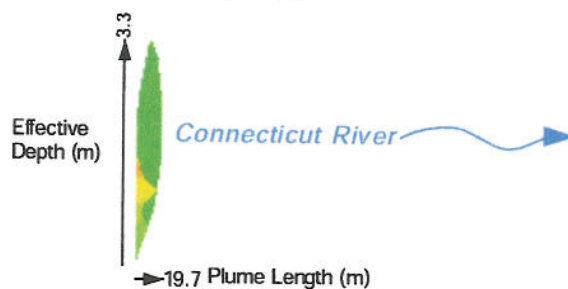
141 Main St., PO Box 850
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtUSA.com

FIGURE

22

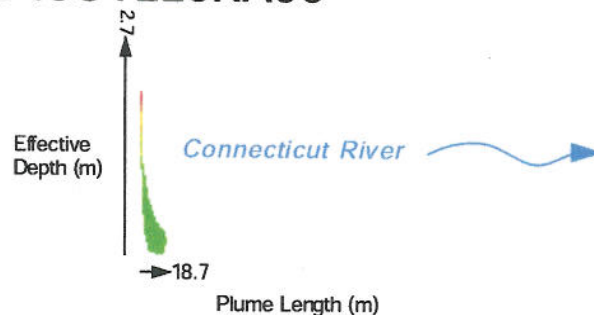
23A

D16CT5KA82

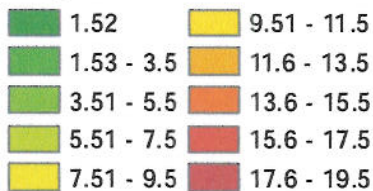


23B

D48CTL20KA50



Longitudinal Plume Delta T (F)



Scale: AS SHOWN	First Light & Power Holyoke, MA	FIGURE
Project No: 1503-037	Mt Tom Response to EPA	
Filename: LongProfile4.mxd	Longitudinal Plume (5)	
Drawn By: KPN	Kleinschmidt Energy & Water Resource Consultants 141 Main St., PO Box 650 Pittsfield, Maine 04967 Telephone: (207) 487-3328 Fax: (207) 487-3124 www.KleinschmidtUSA.com	23
Date Drawn: 04-23-2011		